It is obvious that the movements and other events to which sun-spots are due would only need to become a good deal more energetic to render our sun a perceptibly variable star with a period of eleven years. Now, a cause which may perhaps render them more effective is this. According as the sun or other star shrinks, its sun-spot or star-spot period will presumably undergo some change; but it is very unlikely that this change will follow the same law as that which governs the progressive shortening of the period of natural pulsation within the entire mass of the star. Accordingly, at a certain epoch in the history of the star, the two periods may approximate to one another. Thereupon the events producing star-spots are likely to acquire augmented intensity, which may render the star a variable star for a long cosmical period; in fact, until further shrinkage shall have slowly destroyed the adjustment.

Nor is it necessary that the two periods—that of star-spot frequency and that of natural pulsation within the star—shall become identical. The fluctuations in the number and size of star-spots will probably become exaggerated whenever the two periods in question become related in other simple numerical ratios. Accordingly, a star in the whole course of its life-history may at more than one stage become a variable star, although the most conspicuous fluctuation of its brightness, and that which is represented by the simplest form of light curve,[1] will only occur when the periods become equal.

In Messier V.—the great cluster in Virgo—the evidence which is published by Prof. Bailey in the *Astrophysial Journal* of last November establishes the fact that at least forty of its stars, or nearly one-twentieth part of all the stars of the cluster, differ but little from one another in brightness, and exhibit other resemblances which indicate that these stars are now very much alike in their physical condition. It is, therefore, in a considerable degree probable that at a remote epoch in the past they were so nearly in the same physical condition as to have then had pretty nearly the same brightness, the same star-spot period, and the same period of internal dynamical vibration. This amount of resemblance between so large a proportion of the stars of the cluster will not seem improbable to any one with experience of the appearances of star clusters, in many of which a conspicuous feature is the very notable proportion of the stars which are of one or of some few definite magnitudes.

If then these forty stars were originally nearly alike, they would continue so during their subsequent history. They would all shrink in the same way, they would continue at each subsequent epoch to have nearly the same star-spot period, and also to have all of them approximately the same period of natural internal pulsation; and would accordingly all arrive nearly simultaneously at that stage when these periods approximate. They would then all of them become variables, and under precisely the circumstances which have been observed, viz. with the simplest form of light curve, and with some approach towards having the same maximum of brightness, the same minimum, and the same period of fluctuation.

It has been observed above that in the successive adjustments that may arise while a star is shrinking, some may be of a kind to lead to variability with more than one minimum in each cycle, while the principal adjustment (where the two periods become the same and not merely simply related) will have only one minimum in each cycle. Instances of both are presented by known variable stars; though naturally the second case is that which has been most noticed because it is, when it occurs, that the brightness of the star exhibits the most conspicuous range of fluctuation.

G. JOHNSTONE STONEY.

8 Upper Hornsey Rise, N., March 1.

A New Peripatus from New Zealand.

As the genus Peripatus is always regarded with exceptional interest by zoologists, I should like to make known through the medium of your columns the discovery of a new and very beautiful species in the dense beech forest at the head of Lake Te Anau, in the South Island of New Zealand. I found it a few days ago in the decaying trunks of trees (presumably beech), and have since collected between twenty and thirty specimens. The species resembles the well-known *P. novae-zealandiae* in shape and size, but is at once distinguished both from it and from the other New Zealand species, *P. suteri*, by the possession of only fourteen pairs of walking legs, and by the presence on the dorsal surface of fifteen pairs of green spots arranged segmentally, one pair over each pair of legs, and one pair over the oral papillæ. The general coloration of the dorsal surface is dark grey mottled with orange, with a dark median band and a black or nearly black triangular patch between each two successive green spots on each side. There are also pale orange or whitish papillæ, very regularly arranged. The ventral surface is mottled grey or violet, with pale areas between the legs. The antennæ are grey, ringed with orange. One specimen is almost jet black on the dorsal surface except for the green spots. Adult females are at once distinguished by the presence of an elongated protuberance between the legs of the last pair. This organ is yellowish in colour and bears the genital aperture, closely resembling the ovipositor of the egg-laying Victorian species, *P. oviparus*. The males are rather smaller than the females, and have a white papilla at the base of each leg of the last nine pairs. I propose for this species the name *Peripatus viridimaculatus*.

Lake Te Anau, N.Z., January 14. ARTHUR DENDY.

[1] There is quite enough of correspondence between the light curve of those variable stars which have one minimum in each cycle, and the curve of sun-spot frequency, to create an appreciable presumption in favour of the speculation of the present paper.

Notes on the Occurrence of Amphioxus at Singapore.

THE following notes on the occurrence of *Branchiostoma belcheri*, Gray, at Singapore have been written at the suggestion of Dr. Arthur Willey, who has kindly examined and identified the specimens for me; they were collected by Mr. W. F. Lanchester and myself, and are, I believe, the first that have been obtained from the locality. The first indication we had of the presence of Amphioxus in the district occurred about the middle of November 1898, when a number of young examples were found amongst the material collected by tow-netting at the extreme surface of the water about one or two hours after sunset. At the time we were living on a small island about ten miles off Singapore, and we tow-netted every night just outside or over the edge of the reef surrounding the island. The tidal currents were generally very strong, and no doubt brought a considerable amount of the plankton from the deeper layers to the surface.

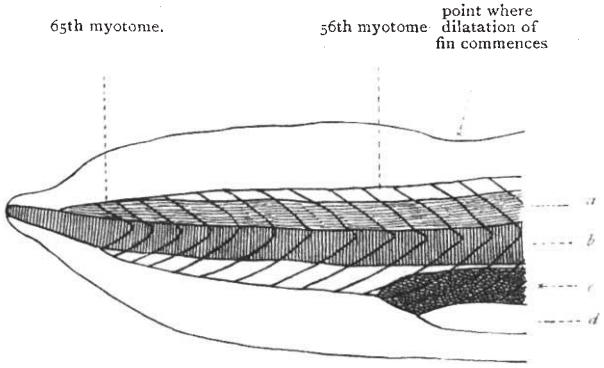

FIG. 1.—*Branchiostoma belcheri*, caudal extremity, before metamorphosis; length of whole larva about 5 mm.

a, Nerve cord; *b*, notochord; *c*, rectum; *d*, ventral fin space.

Up till the end of November (when we left the island) young Amphioxus continued to be fairly plentiful; but they were never met with elsewhere, and in June last year I visited the island again and could find no trace of them.

All these specimens were in different later stages, some having completed their metamorphosis, the fin-rays and ventral fin-chambers being already formed, while in others the gill-slits were still unilateral and opened freely to the exterior.

After the capture of the above examples we repeatedly dredged in the hope of obtaining adult examples, but on only one occasion were we successful, and then only a single specimen was found. It occurred in about six fathoms of water on a bottom composed of somewhat coarse gravel-sand close to the west entrance to Singapore Harbour. I am inclined to attribute our failure in securing more adults to the nature of the ground in which they live. With an ordinary dredge they could easily wriggle through the meshes, and the only time I tried a canvas-bag dredge it filled so rapidly with sand as to be quite useless.

We frequently also used a small shrimp trawl, but it was quite ineffectual as far as Amphioxus was concerned.

Two species of Amphioxus, *Branchiostoma belcheri* and *B. caltellum*, occur in the Malay Seas; the latter is known from Moreton Bay, Torres Straits and Celebes, while *B. belcheri* has been hitherto recorded from Prince of Wales Islands, Torres Straits, Borneo and South Japan, so that either of these species might with equal probability have occurred at Singapore. There is little of interest to note with regard to the specimens themselves. Dr. Willey tells me that in the adult example the "oral cirri are remarkable for the great size of the sense-papillæ which form long projecting conical processes."

In the young, both before and after metamorphosis, the dilation of the dorsal fin at a point vertically above the anus is very marked (see woodcut). This feature has been noted by Mr. Andrews in Japanese examples, and seems to be a point of difference from the specimens examined by Dr. Günther (*v. Zool. Anz.* 18, 1895, p. 59). In the diagram (Fig. 1), which was drawn from a preserved specimen, the notochord is curved up dorsally at the posterior end. This seems to occur in all the preserved examples I have examined, but it is certainly not constant during life. F. P. BEDFORD.

Zoological Laboratory, University College, W.C.

Indian Corn.

I THINK I can satisfy your correspondent, Mr. Kumagusu Minakata (NATURE, February 22, p. 392) about the "maize." I have not Athanasius Nikitin's travels before me, but I have been over a good deal of his ground—and professionally in charge of it—with the book in my pocket.

We cannot now be sure what cereal he meant by "Indian Corn." Probably the term includes several species of Indian millets, great and small; species of Holcus and Eleusine, perhaps even rice. But *Zea Mays*, though well known along Nikitin's line of march, is not a staple grain there even now, though I understand it to be so used, to some extent, a few degrees northwards.

I do not think that any Anglo-Indian botanist will be found to treat it as other than a Portuguese or Musalman importation from the West. The natives certainly look upon it as an imported plant; like potatoes, tobacco, and several others. I suspect that the native trivial name, *Makâ*, implies that some seeds may have been brought to India by pilgrims returning from Arabia.

As to Japan, that country is so much nearer to America, and has so ancient a civilisation and commerce, that I should think it very likely to have received American seeds of maize and of other plants long before the Indian peninsula, though that country is now full of Mexican and Peruvian plants—some thoroughly naturalised—which have come "with the sun."

At one time I thought that there were representations of maize-heads in the Ajantâ caves, but I have had to give the idea up, after examination on the spot. W. F. SINCLAIR.

Chelsea, February 23.

Colour of Horses for Service in Hot Countries.

GENERAL DAUMAS, of the French Army, states in his book on the horses of the Sahara that dark-coloured horses bear great atmospheric heat much better than light-coloured horses. I have had many opportunities in India of proving the correctness of this observation; but I have not been able to find a correct explanation of this fact, and would therefore feel greatly obliged if you or any of your readers would give me it.

When the temperature of the surrounding air is much higher than that of the animal body, the fact of a horse's coat being dark would at first glance appear to be a disadvantage, because it would absorb heat faster than if it were light in colour. Its power of radiation is evidently greater than that of heat absorption. The colour of tropical animals, as we all know, is darker than that of animals in colder climates.

In speaking of light-coloured horses, I refer to the coat (hair) and not to the skin. Absence of pigment in the skin appears to decrease a horse's resistance to the effects of atmospheric heat. Respecting this point, I have not sufficient data to make any definite statement. M. H. HAYES.

Rugby, March 3.

An Interesting Case of Resonance.

A CURIOUS example of resonance is to be noticed in Llandingat Church, Llandovery, South Wales. In one of the windows there is a pane of glass which is not very tightly fixed, being free to oscillate with a definite frequency, which happens to correspond to the frequency of the low pedal "G" of the organ. The consequence is that when the service is taken in G, at the end of each of the Responses, Amens, &c., quite a loud buzzing noise is produced by the resonance of the window; and I have seen strangers sitting near the window seem quite perplexed, not knowing what causes the noise.

Llandovery College, March 4. KENNETH MCMURTRIE.

THE RELATION BETWEEN THE PERIODIC CHANGES OF SOLAR ACTIVITY AND THE EARTH'S MOTION.

ONE of the most interesting questions arising from the problem of the sun's activity is that of a possible connection between the varying display of forces on the solar surface and certain phenomena on our planet. The evidence which has been gradually accumulating can hardly fail to convince us of the existence of an intimate, though still mysterious, relation between some of the manifestations of the earth's magnetic forces and the state of dynamic action on the sun. Not only the extraordinary coincidences repeatedly recorded between solar eruptions and terrestrial magnetic storms, but still more the striking synchronism between the varying frequency of solar spots and the observed changes in the display of auroræ, and in the daily oscillations of the magnetic needle clearly point to that conclusion. Scarcely less certain seems to be the fact, confirmed by many recent investigations, that a greater or less disturbance of the sun's surface is attended by corresponding effects upon terrestrial temperature, rainfall, and other meteorological phenomena.

But there appears to me to be good reason for believing that the influence of the solar activity upon our planet is of an even more profound and far-reaching nature than has hitherto been imagined. I shall endeavour here to state as briefly as possible the results of investigations (more fully developed in *Astr. Nachr.* No. 3619) which have led me to conclude that the period of solar activity can be distinctly traced in the minute residuals which it has not hitherto been possible to eliminate from the observed values of the earth's elements. We are thereby led to infer that the same unknown force which apparently plays so important a part in the meteorology of the sun, acts upon the motion of the earth to such a degree as to produce perturbations which, though minute, are yet of considerable importance from a theoretical and even practical point of view.

As regards the variation of the spot-phenomenon, all the material here required could be taken from Wolf's *Astronomische Mittheilungen*. The chief results which we owe to the never-tiring zeal of this eminent astronomer, and to his intense devotion to this particular branch of astronomical science, are too well known to require, for our present purpose, more than the remark that there are two well-defined periods in the spot-development, the shorter embracing, on an average, about eleven years, and the longer covering, in Wolf's opinion, nearly six times that interval. These two periods are equally important for the following investigation, the curves of the residuals showing the influence of the greater cycle not less distinctly than that of the shorter one. To mention some of the principal features of the "great" spot period—this being probably less familiar to men of science than the eleven years cycle—it may be stated that this curve rises from a minimum near the middle of last century to a high maximum in 1783, then rapidly descends to a low minimum in 1816, attains subsequently another high maximum in 1838, descends again to a moderate minimum in 1861,